Fermentation using Additives. Biotechnology and applied biochemistry. 2009; 52(Pt 2):141-8.

[0198] 15. Tsumoto K, Ejima D, Kumagai I, Arakawa T. Practical Considerations in Refolding Proteins from Inclusion Bodies. Protein Epression and Purification. 2003; 28(1):1-8.

[0199] 16. Yokota H, Saito H, Masuoka K, Kaniwa H, Shibanuma T. Reversed Phase HPLC of Met58 Oxidized rhIL-11: Oxidation Enhanced by Plastic Tubes. Journal of Pharmaceutical and Biomedical Analysis. 2000; 24(2):317-24.

[0200] 17. Farr S B, Kogoma T. Oxidative Stress Responses in *Escherichia coli* and *Salmonella typhimurium*. Microbiological Reviews. 1991; 55(4):561-85.

[0201] 18. Shacter E. Quantification and Significance of Protein Oxidation in Biological Samples. Drug Metabolism Reviews. 2000; 32(3-4):307-26

What is claimed is:

1. A method for producing IL-11, comprising:

introducing an expression vector encoding for a recombinant IL-11 into a yeast, wherein the recombinant IL-11 is not in the form of a fusion protein;

culturing the yeast in a culture media under conditions to induce expression of IL-11;

separating a supernatant from solids of the culture media;

contacting the supernatant with a polyethylene glycol in quantities sufficient to form a suspension comprising a precipitate;

solubilizing the precipitate in a solution comprising a denaturant to produce a crude IL-11 solution;

reducing the denaturant concentration to produce a refolded IL-11 solution;

contacting the refolded IL-11 solution with an ion exchange media; and

eluting a purified IL-11 from the ion exchange media.

2. The method of claim **1**, wherein the polyethylene glycol is provided at a final concentration of between about 4% (w/v) and about 12% (w/v).

3. The method of claim **2**, wherein th polyethylene glycol is provided at a final concentration of between about 6% (w/v) and about 9% (w/v).

4. The method of one of claims **1** to **3**, wherein the polyethylene glycol has an average molecular weight of about 2,000 D to about 20,000 D.

5. The method of claim **4**, wherein the polyethylene glycol has an average molecular weight of about 4,000 D to about 12,000 D.

6. The method of one of claims **1** to **5**, wherein the denaturant is selected from the group consisting of urea, guanidine hydrochloride, and a detergent.

7. The method of claim **6**, wherein the detergent is selected from the group consisting of a dodecyl sulfate salt and N-sarcosyl.

8. The method of one of claims **1** to **6**, wherein the denaturant is guanidine hydrochloride at a concentration of about 4M to 10M in the solubilizing step.

9. The method of claim **8**, wherein the denaturant is guanidine hydrochloride at a concentration of about 5M to 9M in the solubilizing step.

10. The method of claim **8** or **9**, wherein the denaturant is guanidine hydrochloride and is reduced to 0.7M or less to produce the refolded IL-11 solution.

11. The method of one of claims **1** to **10**, wherein the step of reducing the denaturant concentration comprises incubating for about one hour at 18° C. to 25° C. following reduction of the denaturant concentration.

12. The method of one of claims **1** to **11**, wherein the ion exchange media comprises cation exchange media.

13. The method of one of claims **1** to **12**, wherein the step of reducing denaturant concentration is accomplished by dilution of the crude IL-11 solution.

14. The method of one of claims **1** to **13**, wherein the step of reducing denaturant concentration is accomplished by buffer exchange of the crude IL-11 solution.

15. The method of one of claims **1** to **14**, wherein the step of producing the refolded IL-11 solution is performed at a protein concentration of about 0.1 mg/mL to about 10 mg/mL.

16. The method of claim **15**, wherein the step of producing the refolded IL-11 solution is performed at a protein concentration of less than about 2 mg/mL.

17. The method of one of claims **1** to **16**, comprising the further steps of:

contacting the purified IL-11 with a hydrophobic interaction media; and

eluting a polished IL-11 from the hydrophobic interaction media,

wherein the polished IL-11 has a reduced content of oxidized IL-11 relative to the purified IL-11.

18. The method of claim **17**, wherein the hydrophobic interaction media is selected from the group consisting of butyl, hexyl, octyl, and phenyl.

19. The method of one of claim **17** or **18**, wherein the polished IL-11 has a purity of at least about 95%.

20. The method of one of claims **17** to **19**, wherein the polished IL-11 comprises about 5% or less oxidized IL-11.

21. The method of one of claims **17** to **20**, wherein the polished IL-11 comprises about 1% or less dimers of IL-11.

22. The method of one of claims **1** to **21**, wherein the step of producing the refolded IL-11 solution is performed in the absence of co-solutes.

23. The method of one of claims **1** to **22**, wherein the step of producing the refolded IL-11 solution is performed at a pH of about 4 to about 12.

24. The method of claim **23**, wherein the step of producing the refolded IL-11 solution is performed at a pH of about 7 to about 11.

25. The method of one of claims **1** to **24**, wherein the polished IL-11 has a biological activity of about 4×10^6 U/mg to about 1.2×10^7 U/mg when tested using a 7TD1 cell line.

26. The method of claim **25**, wherein the polished IL-11 has a biological activity of about 6×10^6 U/mg when tested using a 7TD1 cell line.

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